REMARKS

Applicant respectfully requests reconsideration of the present application in view of the foregoing amendments and in view of the reasons that follow.

Claims 18, 19 and 22 are requested to be cancelled.

Claims 1, 10, 11, 15, 16 and 20 are currently being amended. Claims 1-17, 20, and 21 are currently pending.

This amendment adds, changes and/or deletes claims in this application. A detailed listing of all claims that are, or were, in the application, irrespective of whether the claim(s) remain under examination in the application, is presented, with an appropriate defined status identifier.

Support for the amendment to claim 1 vis-à-vis the ratio of voids to film thickness is supported in the specification at page 9, lines 13 – 23; and Examples 1, 3, 4, 6, 7, 9 – 11, 16 and 17 appearing in Tables 1, 2, 5, 7 and 10.

Elections/Restrictions

Applicants acknowledge that the Examiner has withdrawn claims 18 and 22 from consideration as being directed to a non-elected invention. Applicants have subsequently cancelled claims 18 and 22.

Claim Objections

On page 3 of the Office Action, the Examiner has kindly suggested that Applicants amend claims 1, 11 and 20 to recite --major-- instead of "main" or "mainly." Further, The Examiner has pointed out minor grammatical errors in claims 15 and 16. Applicants have amended claims 1, 11, 15, 16 and 20 according to the Examiner's suggestions so as to more clearly claim what Applicants regard as their invention.

Claim Rejections Under 35 U.S.C. § 112, second paragraph

On page 3 of the Office Action, the Examiner has rejected claim 19 under 35 U.S.C. § 112, second paragraph as allegedly being indefinite. Without acquiescing to the Examiner's position, and simply in an effort to expedite the prosecution of this application, Applicants have cancelled claim 19. Reconsideration and withdrawal of this rejection are respectfully requested.

Amendment of Title

On page 3 of the Office Action, the Examiner has respectfully suggested that the title of the be amended to "Porous Polyester Film." Applicants have considered the Examiner's kind suggestion and have amended the title accordingly.

Claim Rejections Under 35 U.S.C. § 103(a)

On page 4 of the Office Action, the Examiner has rejected claims 1 – 17 and 19 – 21 under 35 U.S.C. § 103 as being unpatentable over Sasaki *et al.* (EP 0 884 347 A2). Applicants respectfully traverse this rejection.

In this context, the Examiner must present evidence of both (a) some suggestion or motivation to modify the reference or to combine prior-art teachings and (b) a reasonable expectation of success in such a modification or combination. In addition, the reference or references must teach or suggest each feature recited in the claim under consideration.

The Examiner argues that Sasaki teaches that the mixing percentage of the thermoplastic resin relative to polyester depends on a "desired amount of voids." The Examiner goes on to point out that Sasaki's film, as a whole, preferably contains 3 – 20 wt% thermoplastic resin. The Examiner also points out that Sasaki teaches that when the film as a whole contains less than 3 wt% thermoplastic resin, the amount of voids can not be increased to a "desired level" and when the film as a whole contains more than 20 wt% thermoplastic resin, the film has "poor stretch property, lower heat resistance and less strength." From these facts, the Examiner seems to conclude that because Sasaki teaches a material with a "desired amount of voids," and obtains this material by mixing the aforementioned weight percentages of thermoplastic resin with polyester, that Sasaki teaches the "entire applicable range of the

void forming incompatible thermoplastic resins." Moreover, the Examiner asserts that the "suitable void/thickness ratio is either inherently encompassed by Sasaki's teaching, or an obvious optimization to one skilled in the art."

In addition to Sasaki, the Examiner has cited Shirai (EP0672536) as allegedly being indicative of the state of the art vis-à-vis thermal transfer image-receiving sheets with a suitable range of number of microvoids. The Examiner points to page 4, lines 46 – 55 as the place where one would find a teaching of a void/film thickness ratio of between 0.192 – 0.469 voids/μm.

As an initial matter, Applicants have already shown that Sasaki does not inherently teach the claimed void/thickness ratio. In Table 1 of the Declaration filed July 18, 2003, Applicants have shown that Sasaki's films had a ratio of the number of voids to film thickness in the range of 0.16 – 0.19 void/μm. In short, Sasaki does not inherently teach a void/film thickness ratio of not less than 0.2 void/μm as recited in claim 1 prior to the present amendment. Moreover, Sasaki does not inherently teach a void/film thickness ratio of not less than 0.3 void/μm as recited in claim 1, as currently amended.

Applicants assert that the Examiner has not presented evidence of both (a) some suggestion or motivation to modify the Sasaki reference or to combine the Sasaki reference with other prior-art teachings and (b) a reasonable expectation of success in such a modification or combination, in this Office Action or any previous Office Action.

First, there is no suggestion or motivation in the teachings of Sasaki to make porous polyester film with a void/thickness ratio of not less than 0.3 void/μm, as recited in claim 1. Sasaki seems to simply express a desire to make a porous material that contains "micro voids," but Sasaki never discloses or suggests a void/thickness ratio of not less than 0.3 void/μm. Second, while the Examiner seems to suggest that a void/thickness ratio of not less than 0.3 void/μm would have been an obvious modification to one skilled in the art in light of the teachings of Sasaki, he does not offer any reason why one would have a reasonable expectation of success in modifying the teachings of Sasaki.

Applicants offer that even if, *arguendo*, Sasaki's films were made such that the void/thickness ratio were not less than 0.3 void/μm, the films would be significantly different than those presently claimed as a result of, e.g., the materials used to make Sasaki's films. For example, Applicants have previously pointed out that Sasaki's film fails to achieve a sufficient reflective power and resistance to creases (wrinkles); two qualities that are present in the films of the present application.[1] In addition, Sasaki teaches a polyolefin resin that is more preferably on the high viscosity side.[2] In contrast, the resins disclosed in the present application are more preferably on the low viscosity side. In short, modifying the teachings of Sasaki do not provide a reasonable expectation of success.

The deficiencies in Sasaki are not remedied by Shirai (EP0672536). First, the Examiner has provide absolutely no evidence of a motivation for combining the teachings of Sasaki and Shirai. Further, as discussed above, the Examiner has not provided any evidence of a reasonable expectation for success by modifying the teachings of Sasaki alone or in combination with the teachings of Shirai.

The Examiner has taken the position that Shirai teaches a ratio of the number of voids to film thickness range that encompasses the value recited in claim 1 by equating the square root of the number of voids/mm^2 disclosed by Shirai with "ratio of the number of voids to film thickness" and/or the "ratio of the number of voids to film thickness" Applicants offer that equating the square root of the number of voids/mm^2 of the film as described by Shirai with the "ratio of the number of voids to film thickness of not less than 0.30" is not proper for the following reasons.

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[1] Applicants have demonstrated in Tables 2 and 3 of the Declaration filed July 18, 2003, that Sasaki's films are far inferior to films with a void/thickness ratio of not less than 0.3 void/μm. In Table 2 of the Declaration, Applicants have compared Ex. 6 of the present application with Ex. 6 of Sasaki and Ex. 7 of the present application with Ex. 9 of Sasaki. In Table 3, Applicants have compared Ex. 1 of the present application with Ex. 8 of Sasaki.

[2] Sasaki describes melt flow rate (MFR), rather than viscosity, as the melt characteristics of an incompatible thermoplastic resin. It teaches that an MFR of not more than 200 g/10 min, more preferably not more than 30 g/10 min, is preferable for polymethylpentene (TPX) (page 4, lines 51 – 52). In Example 1, Sasaki discloses TPX having an MFR of 26 g/10 min and polypropylene (PP) having a MFR of 1.7. *See* page 11, lines 37 – 40. A small MFR means a small flow rate of molten resin, i.e. high viscosity. Therefore, the two inventions are completely opposite in terms of technical idea.

"Square root of number of voids/mm^2" (hereinafter Rex) is a square root of the number of voids per unit area and the unit of the number of voids is dimensionless and thus no mathematical error is involved as a parameter to characterize the number density of voids. However, Rex and the "ratio of the number of voids to film thickness" (hereinafter Rap) have the same meaning only in limited cases as illustrated below using Figure 1 as an example.

Fig. 1 is a schematic showing an SEM photograph of a film section, assuming a SEM photographic visual field (20 μm x 10 μm) as shown by the solid line frame containing 32 voids distributed therein. The voids are spaced densely without space in between, and the shape of the voids is an isotropic circle (it is a sphere three dimensionally).

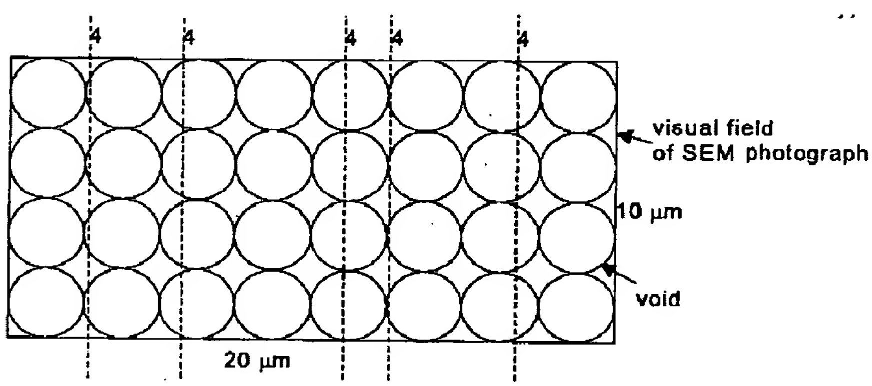

Fig. 1

In this system, Rex and Rap are determined as follows. (Rap is an average of the number of voids at arbitrarily determined 5 points in the dotted line part. In the present specification, an average was taken of 25 points in 5 visual fields.)

$$\text{Rex} = \{32 / (20\ \mu\text{m} \times 10\ \mu\text{m})\}^{1/2} = 0.40\ \mu\text{m}^{-1}$$

$$\text{Rap} = (4+4+4+4+4) / 5 / 10\ \mu\text{m} = 0.40\ \mu\text{m}^{-1}$$

In this case, Rex = Rap, and Rex can be used interchangeably with Rap.

In the case of the claimed films, however, the use of Rex to describe a void-containing film having a higher degree of overlap of voids in the film thickness direction, which is achieved by biaxially drawing the film to flatten the void in the direction parallel to the film surface, is not proper. That is, as is clear from the respective calculation methods, Rap

depends not only on the number of density of voids, but also on the shape and size of the voids. In contrast, Rex is attributed only to the number density of voids. Therefore, Rex can not be used interchangeably with Rap in all cases.

Rex ≠Rap, for example in the situation described in Fig. 2, where the void distribution is not dense, and the size and shape of voids are randomly dispersed, as shown. In Fig. 2, 20 voids are seen in the same visual field as in the above-mentioned SEM photograph (Fig. 1).

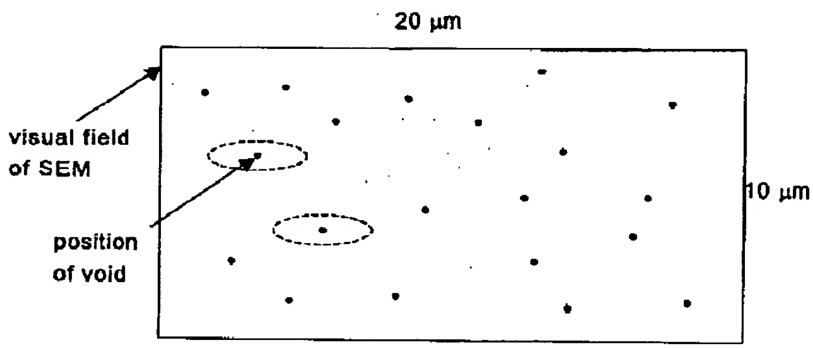

Fig. 2

In Fig. 2, the positions of the voids are shown with black dots. Because the shape of the voids is irrelevant to the calculation of Rex, it is omitted in the Figure. While the voids are uniformly distributed as commented on by the Examiner, the density of the distribution is more random compared to the distribution depicted in Fig. 1.

Rex in this example is calculated as follows:

$$\text{Rex} = (20 / (20\ \mu\text{m} \times 10\ \mu\text{m})\}^{1/2} = 0.32\ \mu\text{m}^{-1}$$

In Fig. 3 and Fig. 4, the voids were placed at the same positions as in Fig. 2. The shape of the voids are isotropic circles (i.e., spheres). An example where the voids are large is shown in Fig. 3. An example where the voids are small is shown in Fig. 4.

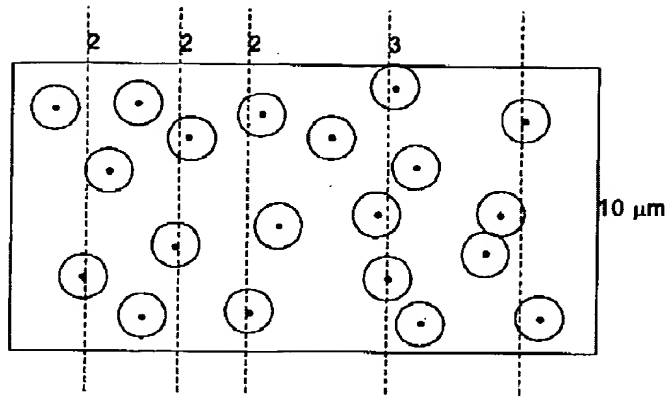

Fig. 3

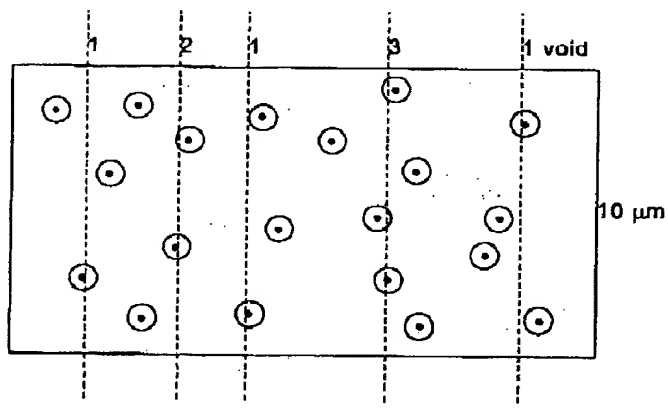

Fig. 4

In the case of Fig. 3:

$$\text{Rap} = \{(2+2+2+3+3)/5 \div 10\ \mu\text{m}) = 0.24\ \mu\text{m}^{-1}$$

In the case of Fig. 4:

$$\text{Rap} = \{(1+2+1+3+1)/5 \div 10\ \mu\text{m}) = 0.16\ \mu\text{m}^{-1}$$

Under the circumstances depicted above, the value of Rap is different from Rex. Further, the Examiner will recognize that the larger the voids are, the greater the Rap becomes.

Next, Applicants consider the effect of void shape on Rap and Rex.

Two cases where the positions of the voids are the same as before and the voids are anisotropic are shown in Fig. 5 and Fig. 6. The sectional areas of the voids are the same in Figs. 4 – 6.

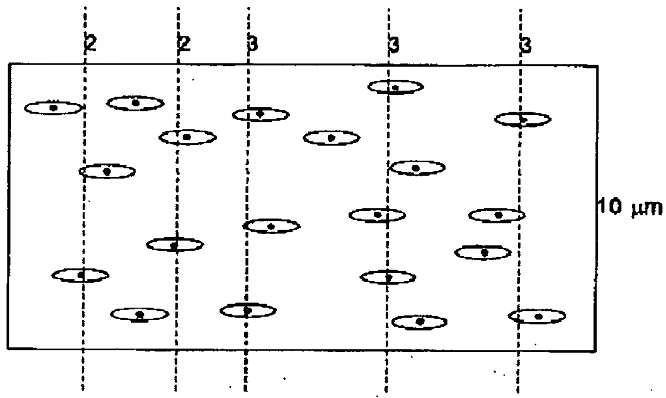

Fig. 5

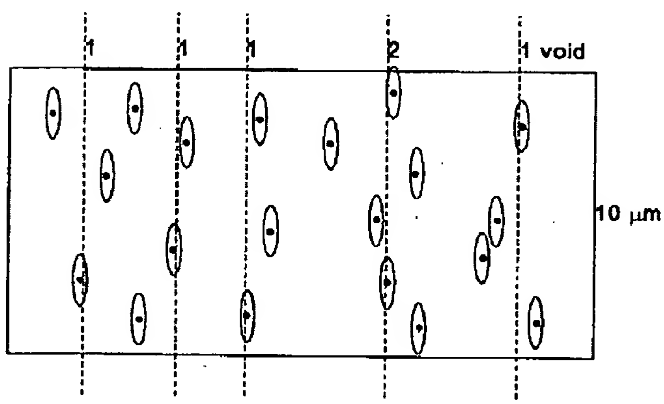

Fig. 6

Rap is determined in the same manner as above. In the case of Fig. 5:

$$\mathrm{Rap} = \{(2+2+3+3+3)/5 \div 10\ \mu\mathrm{m}) = 0.26\ \mu\mathrm{m}^{-1}$$

In the case of Fig. 6:

$$\mathrm{Rap} = \{(1+1+1+2+1)/5 \div 10\ \mu\mathrm{m}) = 0.12\ \mu\mathrm{m}^{-1}$$

In other words, the longer the voids are along the film surface, the greater the Rap becomes.

The above examples are summarized as shown in the following Table.

	Void size	Void shape	Density of number of void laminates Rap (μm^{-1})	Square root of density of number of voids Rex (μm^{-1})
Fig. 3	large	anisotropic	0.24	
Fig. 4	small		0.16	
Fig. 5		transversely long	0.26	0.32
Fig. 6		longitudinally long	0.12	

It is clear therefore that Rap is a parameter reflecting the size and shape of voids and has a different meaning from Rex. Thus, Applicants offer that Shirai does not teach a ratio of the number of voids to film thickness range that encompasses the value recited in claim 1.

Sasaki, alone or in combination with Shirai fails to teach or suggest the presently claimed invention because:

(i) Sasaki does not inherently teach the claimed void/thickness ratio; and

(ii) Shirai does teach a ratio of the number of voids to film thickness range that encompasses the value recited in claim 1, thereby remedying the deficiencies in Sasaki.

In addition, the Examiner has not presented evidence of both (a) some suggestion or motivation to modify the Sasaki reference or to combine the Sasaki reference with other prior-art teachings such as Shirai; and (b) a reasonable expectation of success in such a modification or combination, in this Office Action or any previous Office Action.

In short, the Examiner has not met the burden necessary to establish a *prima facie* case of obviousness vis-à-vis claim 1 and all of the claims which depend from claim 1. Reconsideration and withdrawal of this rejection is respectfully requested.

Correction to the Record

On page 5 of the Office Action, the Examiner has kindly pointed out that in the response filed July 18, 2003, Applicants stated that "the ratio η_o/η_s . . . must not be more than 0.8" Applicants assert that they used the assertive expression "must" in the Remarks section of the previous response inadvertently. Instead, Applicants intended to state that the ratio "is set for not more than 0.8."

Additional Comments

(1) Sasaki describes a method of adjusting the amount of voids. Sasaki, however, fails to suggest control of the ratio of the number of voids to film thickness as defined in the present application to make a film that has a ratio of the number of voids to film thickness of not less than 0.30 void/μm. In fact, the film of Examples 1 – 12 of Sasaki have a ratio of the number of voids to film thickness in the range of 0.16 – 0.19 void/μm. *See* Table 1 of the Declaration submitted with the July 18, 2003 response. Accordingly, the film of the present application, which has a ratio of the number of voids to film thickness of not less than 0.30 void/μm, is clearly different than the film described in Sasaki. Accordingly, the film of the present application is not obvious in light of the teachings of Sasaki.

The present invention resolves the problems found in Sasaki. That is, Sasaki's porous polyester films fail to achieve a sufficient reflective power when used as a reflector. In addition, Sasaki's films exhibit poor handling properties (e.g., resistance to creases (wrinkles)) when used in thermal transfer recording sheets.

The present inventors have found that when the number of voids overlapping in the thickness direction of the film is high, the reflective power and the handling property (resistance to creases (wrinkles)) of the film is improved. Moreover, the inventors have found that by setting the ratio of the number of voids to film thickness of the porous polyester film to not less than 0.30 void/μm, the reflective power of the film, when used as a reflector, can be strikingly improved and the handling property (resistance to creases (wrinkles)) when used in a thermal transfer recording sheet can be markedly improved.

Sasaki does not describe or suggest increasing the number of voids overlapping in the thickness direction of the film.

A porous polyester film having a ratio of the number of voids to film thickness of not less than 0.30 void/μm of the present invention affords a far superior effect as compared to the porous polyester film described in Sasaki. This is clear from the comparison of Ex. 6 of the present application with Ex. 6 of Sasaki and Ex. 7 of the present application with Ex. 9 of Sasaki, as shown in Table 2 of the Declaration submitted with the last response. This is also clear from the comparison of Ex. 1 of the present application with Ex. 8 of Sasaki, as shown in Table 3 in the Declaration submitted along with the previous response. Tables 2 and 3 clearly show that the films of the present invention have greater spectral reflectance and better handling properties[3] than the films of Sasaki.

(2) As mentioned above, the present invention is based on a technical concept of increasing the number of voids overlapping in the thickness direction of the film. Therefore, the production method of the film is also different (viscosity ratio of claim 11). The following clarifies that the present invention was made with a different technical idea from Sasaki.

(2-1) To increase the number of voids overlapping in the thickness direction of the film, the dispersion of a voiding agent (incompatible thermoplastic resin) and an increased aspect ratio of voids (the amount of interface between voids and resin as seen from the film surface is increased by forming flat voids) are important. With flat voids, the effect of low specific gravity decreases but reflectivity increases.

(2-2) The present specification teaches a specific means for the fine dispersion of the incompatible thermoplastic resin, which uses a polyolefin resin and a polystyrene resin in

[3] The evaluation methods of the handling property (resistance to creases (wrinkles)) of the film described in the present application and the film described in Sasaki are somewhat different. The evaluation results were obtained by the method described in the specification of the present application, which method is more demanding than that disclosed by Sasaki. Briefly, the evaluation of the handling property (resistance to creases (wrinkles)) of the film described in the present specification at page 25, lines 28 – 35, includes determination of resistance to creases (wrinkles) of a film capable of standing the load at a smaller radius of curvature, using a metal pin against a glass rod. A metal pin having a diameter of 1.4 mm and a glass rod having a diameter of 5 mm were used. A metal pin and glass rod of these dimensions was also used to evaluate the films of Sasaki. *See* Sasaki at page 10, lines 34 – 44.

combination, and which comprises setting the melt viscosity ratio (η_o/η_s) thereof to a specific range (0.8 or below) (claim 11).

(2-3) The present specification shows an example of a void-containing polyester film having a PET/PS/PO (PO = Polyolefin) composition as shown below in Fig. 7. Because the order of surface energy of each resin is PET > PS > PO, PS embraces PO (core shell structure = structure reducing interface energy). In other words, PS also functions as a phase stabilizer. *See* Fig. 7 below.

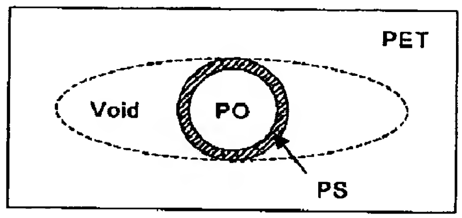

Fig. 7 Core shell structure of voiding agent

(2-4) The balance between sheer force applied to a polyolefin (PO) resin and the fine dispersion of the PO within PET has an effect on the melt viscosity (η_o) of the resulting material. For example, when PO is fed into an extruder in pellets together with other resins (e.g., PS) and is dispersed in PET by the shear force of a screw or die, the PO deforms to a great extent thereby giving a material with lower viscosities (η_o) and fine dispersion. When there is fine dispersion, the viscosity (η_o) of PO is lower and the volume of the voids obtained decreases.

In Sasaki, in view mainly of the flexibility, light weight property, surface smoothness and the like of the film, the preferable melt viscosity range was determined based on the balance between the sheer force applied and the dispersion of the PO.

The following Fig. 8 shows a model of dispersion of melt viscosity (η_o) of polyolefin.

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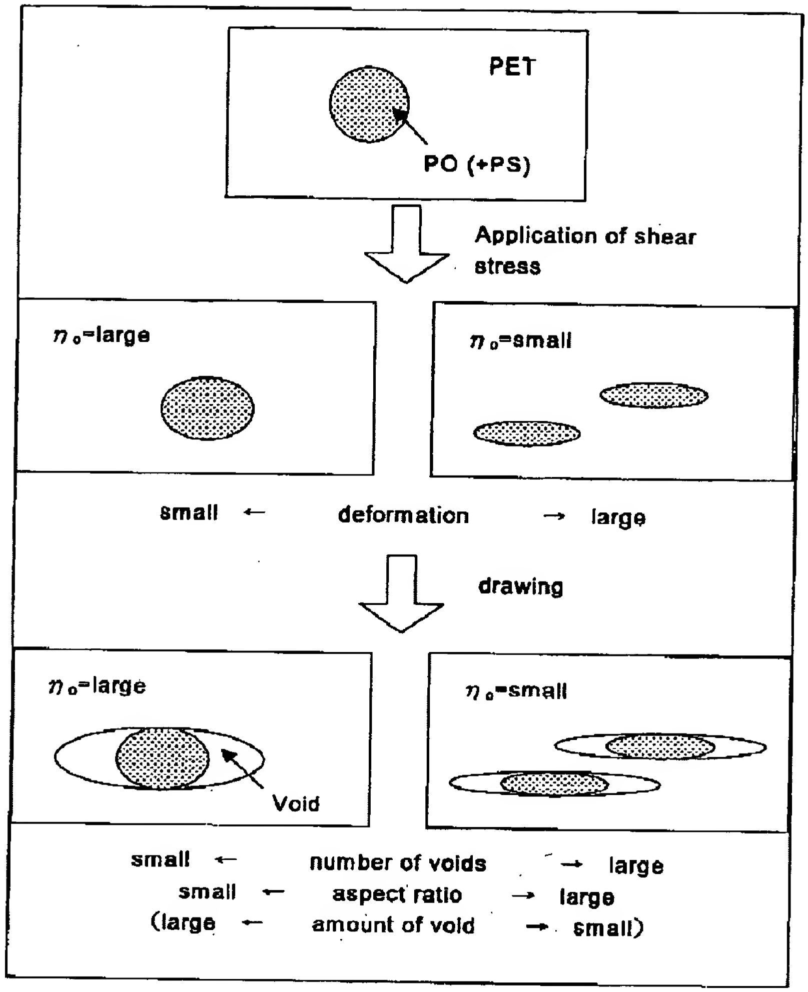

Fig. 8 The number of voids in the film thickness direction increases with smaller η_o

(2-5) Melt viscosity (η_s) of polystyrene

By the same mechanism as with PO, lower viscosity (η_s) is preferable for fine dispersion of voids when PS alone is used. When the viscosity of PS becomes smaller, however, PS yields to the shear force and flows, thus destroying the core shell structure. As a result, the interface energy grows and the voids are coarsely dispersed. Fig. 9 shows a model of this phenomenon. Fig. 10 shows the relationship between the melt viscosity ratio (η_o/η_s) and void size of PS and PO. Applicants found that the number of voids overlapping in the thickness direction increased by the action of melt viscosity ratio (η_o/η_s), and the effective ratio is 0.8 or below, as described in the specification.

Experimental results have confirmed that void dispersability radically changes at near melt viscosity ratio (η_o/η_s) = 1.0. Moreover, Applicants have found that the fine dispersion state reaches an almost stable level when the ratio reaches 0.8 or below as shown in Table 2 and Table 3 of the Declaration submitted with the previous response. The melt viscosity ratio (η_o/η_s) of PS and PO of the film of Examples 1, 6 and 7 of the present application was 0.33, and the ratio of the number of voids to film thickness then was not less than 0.3 void/μm. In contrast, the melt viscosity ratio (η_o/η_s) of PS and PO of the film of Example of Sasaki was 0.81 and the ratio of the number of voids to film thickness was 0.19 void/μm or below.

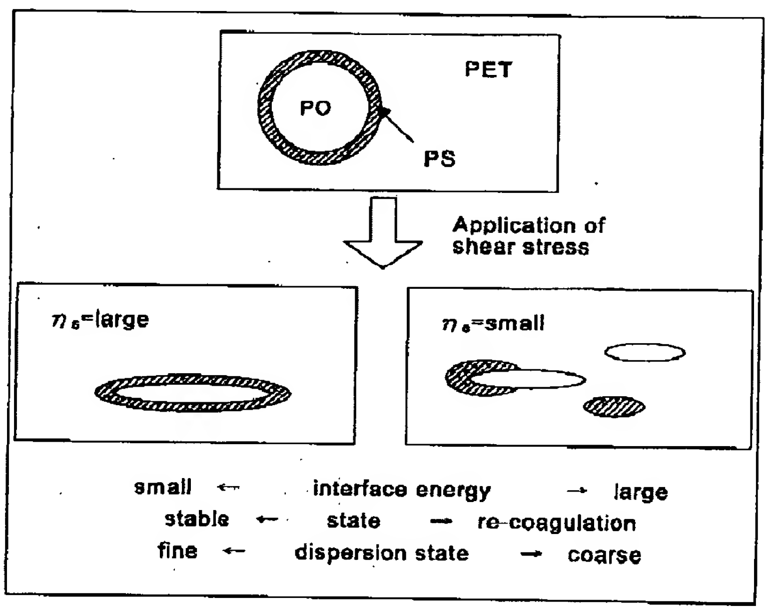

Fig. 9 When η_s is small, the core shell structure is destroyed and re-coagulation occurs.

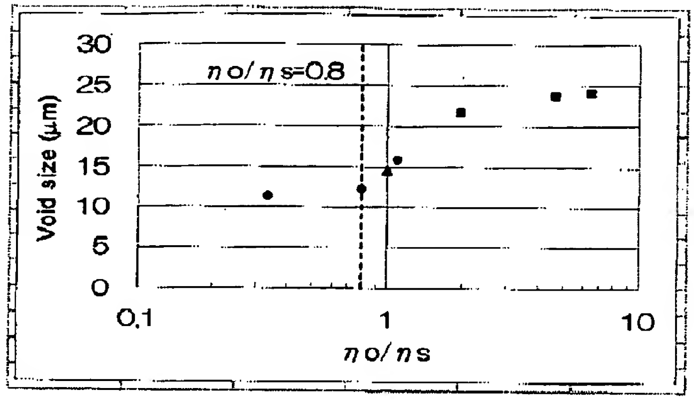

Fig. 10 Voids are finely dispersed stably at melt viscosity ratio of ≤ 0.8

(3) Comparison with Sasaki

(3-1) Sasaki does not describe or suggest the ratio of the number of voids to film thickness of the present application, not to mention the viscosity ratio relating thereto.

(3-2) Indeed, Sasaki teaches away from the present application.

Sasaki describes melt flow rate (MFR), rather than viscosity, as the melt characteristics of an incompatible thermoplastic resin. Sasaki teaches that an MFR of not more than 200 g/10 min, more preferably not more than 30 g/10 min, is preferable for polymethylpentene (TPX) (page 4, lines 51 – 52). In Example 1, Sasaki discloses TPX having an MFR of 26 g/10 min and polypropylene (PP) having a MFR of 1.7. *See* page 11, lines 37 – 40. A small MFR means a small flow rate of molten resin, i.e. high viscosity. Therefore, the two inventions are completely opposite in terms of technical idea.

(4) Technical importance of the "ratio of the number of voids to film thickness"

In the evaluation of plastic materials containing voids, the size and number of voids is important. For this reason, evaluation in number density is often performed. While it is true that the property of materials showing function when voids are steric and isotropic "bulk," as in polyurethane foam and polystyrene foam, can be often expressed appropriately by the number density of voids, the same is not necessarily true to biaxially oriented films such as those claimed. In a stretched film, the functions required in the direction parallel to the

surface and in the direction perpendicular thereto are different. Therefore, the number density of voids often fails to suitably express the property of a stretched film. In addition, the film of the present invention contains voids having a markedly anisotropic shape, even when the positional distribution is the same in the entire film (see the attached SEM photograph in APPENDIX A). The number density of voids does not provide information of the shape and size of the voids. Therefore, the number density of voids is insufficient to accurately characterize the film. In short, the "ratio of the number of voids to film thickness" is a parameter that characterizes the size and shape of voids and distribution of those voids. In the context of the present invention, the "ratio of the number of voids to film thickness" is important to improved reflectivity and handling property of the film.

Conclusion

Applicant believes that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested.

The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicant hereby petitions for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 19-0741.

Respectfully submitted,

Date Jan. 16, 2004

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APPENDIX A

SEM PHOTOGRAPH OF A SECTION OF

VOID CONTAINING POLYESTER FILM OF THE PRESENT INVENTION